Claims

What is claimed is:

1. A machine tool comprising at least one linear axis, and one of a rotary axis and a rotation axis, one of the rotary axis and rotation axis being programmable to move to a specified position in sequential or simultaneous synchronization with a movement of the at least one linear axis, and a toolholder mounted to a tool rest, the toolholder including a cutting tool defining a lead angle or a trailing angle with respect to the workpiece, wherein the lead angle or the trailing angle remains constant by controlling the movement of one of the rotary axis and rotation axis about an axis other than a centerline of the workpiece independently of the movement of the at least one linear axis.

2. The machine tool according to Claim 1, wherein the cutting tool defines a first trailing angle during a roughing pass and a second trailing angle during a finishing pass, the second trailing angle being different than the first trailing angle.

3. The machine tool according to Claim 1, wherein the cutting tool includes a cutting tool nose radius that is substantially concentric with a longitudinal axis of the toolholder.

4. The machine tool according to Claim 1, wherein the cutting tool is positioned on one side of the centerline of the workpiece when the workpiece rotates in a first direction, and wherein the cutting tool is positioned on an opposite side of the centerline of the workpiece when the workpiece rotates in a second, opposite direction.

5. The machine tool according to Claim 1, wherein the lead angle of the cutting tool is used to anticipate interference between the cutting tool and the workpiece.

6. The machine tool according to Claim 1, wherein a clearance angle of the cutting tool is adjusted with respect to a geometry of the workpiece.

7. The machine tool according to Claim 1, wherein the lead angle of the cutting tool is adjusted with respect to a geometry of the workpiece.

8. The machine tool according to Claim 1, wherein a rake face of the cutting tool is substantially perpendicular to a longitudinal axis of the toolholder.

9. A machine tool comprising at least three mutually perpendicular linear axes, and one of a rotary axis and a rotation axis, the one of the rotary axis and rotation axis being programmable to move to a specified position in synchronization with a movement of one of the at least three mutually perpendicular linear axes, and a toolholder mounted to a tool rest, the toolholder including a cutting tool defining a lead angle with respect to a workpiece, wherein the lead angle is selectively determined by programming the rotary axis to move about an axis <u>other than a longitudinal axis of the workpiece</u> to a specific portion of the workpiece at a specific velocity in synchronization with a movement of one of the at least three mutually perpendicular linear axes.

10. The machine tool according to Claim 9, the machine tool back calculates the specific velocity for each linear axis to intersect the specific portion of the workpiece at a specific point in time.

11. A programmable toolholder, the toolholder being mounted in a tool rest of a machine tool comprising at least three mutually perpendicular linear axes, and one of a rotary axis and a rotation axis, the one of the rotary axis and rotation axis being programmable to move to a specific position in synchronization with a movement of one of the at least three mutually perpendicular linear axes, the toolholder comprising:

a tool spindle for retaining the toolholder in a tool rest;

an adaptor for supporting a cutting tool, said cutting tool being retained in the adaptor by a clamp, the cutting tool defining a lead angle or a trailing angle,

wherein the lead angle or the trailing angle remains constant by moving one of the rotary axis and rotation axis about an axis other than a centerline of the workpiece independently of the movement of the at least three mutually perpendicular linear axes.

12. The toolholder according to Claim 11, wherein the cutting tool defines a first trailing angle during a roughing pass and a second trailing angle during a finishing pass, the second trailing angle being different than the first trailing angle.

13. The toolholder according to Claim 11, wherein the cutting tool includes a cutting tool nose radius that is substantially concentric with a longitudinal axis of the toolholder.

14. The toolholder according to Claim 11, wherein the cutting tool is positioned on one side of a centerline of the workpiece when the workpiece rotates in a first direction, and wherein the cutting tool is positioned on an opposite side of the centerline of the workpiece when the workpiece rotates in a second, opposite direction.

15. A method of programming a machine tool, the machine tool comprising at least three mutually perpendicular linear axes, one of a rotary axis and a rotation axis, and a toolholder mounted to a tool rest, the toolholder including a cutting tool defining a lead angle or a trailing angle with respect to a workpiece, the method comprising the steps of:

independently moving one of the rotary axis and rotation axis about an axis other than a centerline of the workpiece to a specified position in synchronization with a movement of one of the at least three mutually perpendicular linear axes,

maintaining the lead angle or the trailing angle constant as a vector of movement of at least one of the linear axis is changed.

16. A method of programming a toolholder with a cutting tool, comprising the steps of:

reversing a direction of rotation of a workpiece, and

positioning the cutting tool on opposite side of a centerline of rotation of the workpiece,

whereby a flank face of the cutting tool is utilized to perform a machining operation.

17. A method of programming a machine tool comprising at least three mutually perpendicular linear axes, one of a rotary axis and a rotation axis, and a toolholder mounted to a tool rest, the toolholder including a cutting tool, the method comprising the steps of providing a macro including a geometry of a workpiece to be machined and a geometric relationship of the cutting tool with respect to the workpiece, whereby the macro calculates the movement of the at least three mutually perpendicular linear axes, and the movement of one of the rotary axis and rotation axis about an axis other than a centerline of the workpiece that is required to maintain a specified cutting tool geometry as the cutting tool proceeds across a surface of the workpiece.

18. The method according to Claim 17, whereby the macro calculates a velocity of the cutting tool for each axis.

19. The method according to Claim 17, whereby the macro varies a distance between the cutting tool and the workpiece such that a clearance angle of the cutting tool remains constant as the cutting tool moves toward a centerline of the workpiece.